Comments for the July 10, 2018 SWRCB meeting; Agenda Item 3

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To introduce myself

- Biology faculty at UC Berkeley. Recently semi-retired.
- Worked almost exclusively on pyrethroids since 2003, research about two-thirds funded by SWRCB or Region 5.
- Collected 750 water or sediment samples, largely Region 5. One-third toxic when tested and likely due to pyrethroids.
- 40 peer-reviewed publications on pyrethroids
- 15 peer-reviewed publications on bioavailability.

BIOAVAILABILITY

Under the proposed approach, numerical triggers only apply to the presumed bioavailable, freely dissolved pyrethroid fraction. Key points: 1) a very small fraction of the total pyrethroid, and 2) unmeasurable by dischargers.

Since commercial labs cannot measure this fraction, staff propose it be mathematically determined using partitioning theory.

No limits are placed on the amount of pyrethroids discharged, provided they are bound to particles at the time the sample is processed (often around 75-99% of the total pyrethroid).

J. Gan bifenthrin data (UC Riverside) California samples		Pyrethroid registrant's bifenthrin data A single Massachusetts sample (The default value now in the BPA)
K_{oc} estimates (with various samples)		**K_{oc} estimate (one sample)**
98,000		4,228,000
628,571		
990,000		
1,200,000		
1,330,000	Default value 1,757,059	
1,720,000		
1,794,000		
5,740,000		
11,571,429		
K_{doc} estimates (with various samples)		**K_{doc} estimate (one sample)**
180,000		1,737,127
600,000		
2,690,000	Default value 3,550,000	
7,150,000		
43,440,000		

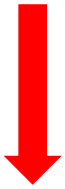
100-fold difference

200-fold difference

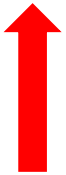
There is no such thing as a universal coefficient. For pesticides like pyrethroids, a 100-fold variation among measurements is the norm (Wauchope et al. 2002).

The numerical triggers are highly dependent on the K values used (simplified expression below)

The measured concentration



$$\frac{\text{Total Pyrethroid}}{K_{oc},\ K_{doc}\ldots\ldots\text{(and other variables)}} = \text{Regulated Quantity}$$



Both K values unknown within a factor of 100 or more

1 or less = Compliance
2 or more = Exceedance

Uses of bioavailability in establishing pyrethroid regulatory thresholds

- As a conceptually-attractive, long-term goal for risk assessment…….GREAT!
- As a theoretical framework for guiding research needs……FINE!
- For immediate regulatory application with the available science…….DANGEROUS WISHFUL THINKING!

- The bioavailability approach used is far beyond currently defensible science.
- A study to derive California-based K values is planned by the Region. But should it be Board policy to adopt a Basin Plan Amendment with virtually no supporting data, and then conduct after-the-fact research, hoping that the adopted policy can be shown to be workable?
- In the near term, only conventional approaches are defensible (1. total concentration, or 2. just do toxicity testing instead of trying to use chemistry to predict what samples are likely to be toxic).

LEVEL OF PROTECTION PROVIDED

Comparison of staff's recommended triggers to toxicity thresholds (Table 5-11 of staff report)

	Hyalella 96-h LC50 (ng/L)	Acute trigger levels	Chronic trigger levels
Bifenthrin	0.5	0.8	0.1
Cyfluthrin	0.55	0.8	0.2
Cypermethrin	0.56	1	0.3
Esfenvalerate	0.85	2	0.3
Cyhalothrin	0.3	0.7	0.3
Permethrin	7	6	1

The crustacean, Hyalella azteca

- Found in most California fresh waterbodies.
- In areas with aquatic vegetation, often the dominant species.
- In areas of aquatic vegetation, a large component of fish diets
  (Relative importance in the diet = 67% for prickly sculpin, 28% for bluegill, 22% for Tule perch, 19% for largemouth bass, 15% for chinook salmon, 6% for splittail. (Toft et al., 2003)).
- One of four species routinely used for toxicity testing in our freshwater environmental monitoring programs (e.g. SWAMP).

Staff responses

- The trigger values are based on the 5th percentile of the species sensitivity distribution, and we are simply being consistent with the protocol underlying EPA Water Quality Criteria.

  The EPA 5th percentile approach to developing criteria is a guideline, not a requirement. Local authorities are permitted to alter as needed to meet local needs.

- It is necessary to provide only a "reasonable level of protection", because there are so many unknowns as to whether even the proposed trigger values can be attained.

  Reasonable level of protection is essentially a euphemism for acceptable level of toxicity. I agree attainment is uncertain. But rather than embed an acceptable level of toxicity in the Basin Plan, would it not be preferable to be consistent with long-standing Board policy of avoiding all toxicity, while being necessarily flexible in its implementation in the case of pyrethroids?